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EXAMINER

MOTSINGER, SEAN T

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DORON SHAKED

Appeal 2009-004911
Application 10/675,944
Technology Center 2600

Decided: December 3, 2009

Before KENNETH W. HAIRSTON, THOMAS S. HAHN,
CARL W. WHITEHEAD, Jr., *Administrative Patent Judges*.

HAIRSTON, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. §§ 6(b) and 134 from the final rejection of claims 1 to 3, 14, 15, and 23. We will reverse.

The disclosed invention relates to a color vision correction apparatus using Retinex-type algorithms (Spec. 1:3-4). In Retinex-type processing a perceived image S is equal to a reflectance R multiplied by an illumination L ($S=R*L$), and the illumination L can be estimated from an input image S

(Spec. 1:25-32). Appellant claims and discloses a Retinex-type image processing method and apparatus (claims 1 and 14). The apparatus includes (i) a down-sampling module to produce sub-sampled images of an input image, (ii) a non-linear illumination estimation module producing an interim illumination estimation, and (iii) an up-sampling module that receives the input image and the interim illumination estimation and estimates a final illumination (Figs. 1, 2; claim 1; Spec. 5:26-6:33; Abstract).

Claims 1 and 14 are representative of the claims on appeal, and read as follows:

1. An apparatus for speeding up Retinex-type processing of an input image, comprising:

a down-sampling module configured to produce one or more sub-sampled images of the input image;

a non-linear illumination estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations;

an up-sampling module configured to receive the input image and to interpolate the interim illumination estimations to produce an illumination estimation by using the input image as a guide in the interpolation, and wherein the illumination estimation is usable to perform a Retinex-type correction to the input image.

14. A method for speeding up Retinex processing of a high resolution input image, comprising:

producing one or more low resolution input images by sub-sampling the high resolution input image;

generating an interim illumination estimation for each of the one or more low resolution input images;

generating an illumination estimation suitable for Retinex-type correction by up-sampling the interim illumination estimations, wherein generating the illumination estimation comprises combining the input image and the interim illumination estimations; and

producing a Retinex-corrected output from the combined input image and the illumination estimation.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Sakatani	US 2004/0091164 A1	May 13, 2004
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Kimmel	WO 02/089062 A2	Nov. 7, 2002
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Appellant's Admitted Prior Art (APA), Figure 2 of the Drawings,
Specification at pages 2 and 3

The Examiner rejected claims 1 to 3, 14, 15, and 23 under 35 U.S.C. § 103(a) based upon the teachings of Kimmel, APA, and Sakatani.

Kimmel describes a non-linear iterative illumination estimation module (Fig. 2; Log 102, iterative estimator 104, summer 108, and Exp 110; p. 3, ll. 19-27).

APA describes and shows a down-sampling module 32, a linear illumination estimation module 30, an up-sampling module 34, and an illumination manipulation module 20 for receiving an input image S interpolating a reflectance R based on the illumination estimation L'' (Fig. 2).

Sakatani describes a Retinex image processing program and device that performs down-sampling (i.e., lowering an image resolution) of an original input image to produce a blurred image (¶¶ [0114]-[0118]).

The Examiner acknowledges (Ans. 4) that “Kimmel does not explicitly disclose a down-sampling module, an up-sampling module, and an illumination manipulation module.” The Examiner relies on APA as disclosing a down-sampling module, up-sampling module, and an illumination manipulation module.

The Examiner then cites Sakatani for a disclosure that “the resolution of the blurred image produced by the formula (7) is changed to match with the resolution of the original image $I_i(x, y)$ by interpolation” (¶ [0118]; Ans. 6); and cites page 3 of APA as disclosing that a high resolution input image S is used to select output pixels when interpolation is performed on a low resolution intermediate image (Ans. 6).

With respect to claim 1, the Examiner contends (Ans. 6) that it would have been obvious to one of ordinary skill in the art “to have an upsampling module that uses the input image as a guide in the interpolation for the benefit of performing Retinex type processing as taught by both the admitted prior art and Sakatani.” With respect to claim 14, the Examiner contends (Ans. 7) that it would have been obvious to one of ordinary skill in the art “to generate the illumination estimation by combining the input image and the interim illumination estimations for the benefit of performing Retinex type processing as taught by both the admitted prior art and Sakatani.”

Appellant argues *inter alia* (App. Br. 12-13; Reply Br. 8-9), that the skilled artisan would not have made the modification suggested by the Examiner because neither APA nor Sakatani discloses or suggests an up-sampling module that receives an input image and uses the input image to

interpolate interim illumination estimations to produce an illumination estimation, as set forth in apparatus claim 1.

Appellant also argues *inter alia* (App. Br. 14-15; Reply Br. 11-12), that the skilled artisan would not have made the modification suggested by the Examiner because neither APA nor Sakatani discloses or suggests generating the illumination estimation by combining the input image and the interim illumination estimations, as set forth in method claim 14.

As indicated *supra*, neither APA nor Sakatani discloses using a high resolution input image as a guide or input at the up-sampling module. At most APA discloses using the input image in the illumination manipulation module 20, but this input is at the illumination estimation stage *after* the interim illumination estimation and up-sampling have already occurred (*see* Fig. 2). And, although Sakatani may match resolution of a blurred image to an input image using interpolation, there is no disclosure or suggestion in Sakatani that the input image is applied at an *up-sampling* stage of a Retinex process such as in APA.

We agree with Appellant (Reply Br. 8) that the Examiner's citation of page 3 of APA (*see* Ans. 6), for a disclosure of a high resolution input image S being used to select output pixels when interpolation is performed, pertains to illumination manipulation module 20 and not to the up-sampling module 34. We agree with Appellant (Reply Br. 9) that the Examiner's statement that APA "does not preclude an engineer or ordinary skill in the art from using the original image as a guide in the interpolation performed by the up-sampling module 34, as taught by Sakatani in paragraph 117" (Ans. 11) is confusing. As a result, we agree with Appellant's contentions

(App. 12-15; Reply Br. 8-12) that neither APA nor Sakatani discloses or suggests using a high resolution input image as a guide or input at the up-sampling module as set forth in claims 1 and 14.

The Examiner's "articulated reasoning . . . in the rejection must possess a rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). In the instant case, the Examiner has not provided a rational underpinning showing that either APA or Sakatani discloses or suggests the feature missing from Kimmel of using an input image in the up-sampling module or process of generating an illumination estimate.

Thus, we agree with the Appellant's argument that the skilled artisan would not have combined the teachings of the applied references to arrive at the claimed invention. In summary, the obviousness rejection of claims 1 to 3, 14, 15, and 23 is reversed because the Examiner's articulated reasons for combining the teachings of the references to Kimmel, APA, and Sakatani do not support a legal conclusion of obviousness. *KSR Int'l v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007).

The decision of the Examiner is reversed.

REVERSED

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